Kalinga University
Technology
Bachelor Of Technology (Civil Engineering)

PO

S. No.	Program Outcome (PO) Description
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO

S. No.	Program Specific Outcome (PSO) Description
1	Ability to apply principles of Civil Engineering for the entire life cycle of the project ranging from initial design to the closure of the project.
2	Demonstrate proficiency in one the following specialized areas of Civil Engineering Construction Materials a Management, Structural and Geotechnical Engineering, Environmental and Water Resources Engineering, Transportation Engineering and Remote Sensing & Geographic Information Systems.

CO

S.No.	Course Code	Course Name	Course Outcome (CO's) - Description
1	BTCE101	Programming for Problem Solving	**CO1:** To develop simple algorithms for arithmetic and logical problems.
			CO2: To translate the algorithms to programs & execution (in C language).
			CO3: To implement conditional branching, iteration and recursion.
			CO4: To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
			CO5: To use arrays, pointers and structures to develop algorithms and programs.
2	BTCE102	Emerging Domain in Electronics Engineering	**CO1:** Understand the concept of PN Junction and devices.
			CO2: Understand the concept of BJT, FET and MOFET.
			CO3: Understand the concept of Operational amplifier
			CO4: Understand the concept of measurement instrument.
			CO5: Understand the working principle of different type of sensor and their uses.
			CO6: Understand the concept of IoT system & Understand the component of IoT system
3	BTCE103	Engineering Chemistry	**CO1:** Use of different analytical instruments.
			CO2: Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
			CO3: Measure hardness of water.
			CO4: Estimate the rate constant of reaction.
4	BTCE104	Engineering Mathematics	**CO1:** Remember the concept of matrices and apply for solving linear simultaneous equations.
			CO2: Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
			CO3: Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
			CO4: Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
			CO5: Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

5	BTCE105	English	**CO1:** Students will be enabled to understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.
			CO2: Students would be able to create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
			CO3: Students will apply it at their work place for writing purposes such as Presentation/official drafting / administrative communication and use it for document/project/report/research paper writing.
			CO4: Students will be made to evaluate the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.
			CO5: Students will apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.
6	BTCE106	Emerging Technology for Engineers	**CO1:** Understand the concepts of internet of things, smart cities and industrial internet of things
			CO2: Understand the concepts of cloud computing
			CO3: Understand the concepts of block chain, cryptocurrencies, smart contracts
			CO4: Understand design principles, tools, trends in 3 D printing and drones
			CO5: Understand augmented reality (AR), virtual reality (VR), 5G technology, brain computer interface and human brain
7	BTCE201	Fundamentals of Mechanical Engineering & Mechatronics	**CO1:** Identification of key elements of mechatronics system and its representation in terms of block diagram
			CO2: Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O
			CO3: Interfacing of Sensors, Actuators using appropriate DAQ micro-controller
			CO4: Time and Frequency domain analysis of system model (for control application)
			CO5: PID control implementation on real time systems
			CO6: Development of PLC ladder programming and implementation of real life system.
			CO1: Apply the concepts of KVL/KCL and network theorems in solving DC circuits.

8	BTCE202	Basic Electrical Engineering	**CO2:** Analyze the steady state behavior of single phase and three phase AC electrical circuits.
			CO3: Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
			CO4: Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
			CO5: Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.
9	BTCE203	Engineering Physics	**CO1:** To solve the classical and wave mechanics problems
			CO2: To develop the understanding of laws of thermodynamics and their application in various processes
			CO3: To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
			CO4: To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams
10	BTCE204	Engineering Mathematics-II	**CO1:** Understand the concept of differentiation and apply for solving differential equations.
			CO2: Remember the concept of definite integral and apply for evaluating surface areas and volumes.
			CO3: Understand the concept of convergence of sequence and series. Also evaluate Fourier series
			CO4: Illustrate the working methods of complex functions and apply for finding analytic functions.
			CO5: Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals
11	BTCE205	Environmental Science	**CO1:** Understand the fundamental principles and concepts of environmental science, including ecosystems, biodiversity, natural resources, pollution, and sustainability.
			CO2: Recognize and analyze the impacts of human activities on the environment, including pollution, deforestation, climate change, and habitat destruction.
			CO3: Evaluate and apply scientific methods and tools for studying and monitoring the environment, including data collection, analysis, and interpretation.
			CO4: Develop an awareness of environmental laws, policies, and regulations, and their implications for environmental protection and sustainability.

			CO5: Apply critical thinking skills to assess and propose solutions to environmental challenges, such as resource management, pollution control, and conservation.
			CO6: Enhance communication skills through effective presentation and discussion of environmental issues, both orally and in writing.
			CO7: Foster an appreciation for the value of biodiversity, natural ecosystems, and the interdependence of humans and the environment.
			CO8: Foster a sense of personal responsibility and ethical consideration towards the environment and promote sustainable practices in daily life.
12	BTCE206	Artificial Intelligence for Engineers	**CO1:** Understand the evolution and various approaches of AI
			CO2: Understand data storage, processing, visualization, and its use in regression, clustering etc.
			CO3: Understand natural language processing and chatbots
			CO4: Understand the concepts of neural networks.
			CO5: Understand the concepts of face, object, speech recognition and robots.
13	BTCE301	Mathematics –III	**CO1:** The idea of Laplace transform of functions and their application
			CO2: The idea of Fourier transform of functions and their applications
			CO3: The basic ideas of logic and Group and uses.
			CO4: The idea s of sets, relation, function and counting techniques.
			CO5: The idea of lattices, Boolean algebra, Tables and Karnaugh maps.
14	BTCE302	Technical Communication	**CO1:** Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers.
			CO2: Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.
			CO3: Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.
			CO4: Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence.
			CO5: It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.
15	BTCE303	Engineering Mechanics	**CO1:** Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
			CO2: Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
			CO3: Apply basic knowledge of mathematics and physics to solve real-world problems.

			CO4: Understand basic dynamics concepts – force, momentum, work and energy.
			CO5: Understand and be able to apply Newton's laws of motion;
16	BTCE304	Surveying & Geomatics	**CO1:** Describe the function of surveying and work with survey instruments, take observations, and prepare plan, profile, and cross-section and perform calculations.
			CO2: Calculate, design and layout horizontal and vertical curves.
			CO3: Operate a total station and GPS to measure distance, angles, and to calculate differences in elevation. Reduce data for application in a geographic information system.
			CO4: Relate and apply principles of photogrammetry for surveying.
			CO5: Apply principles of Remote Sensing and Digital Image Processing for Civil Engineering problems.
17	BTCE305	Fluid Mechanics	**CO1:** Understand the broad principles of fluid statics, kinematics and dynamics
			CO2: Understand definitions of the basic terms used in fluid mechanics
			CO3: Understand classifications of fluid flow
			CO4: Apply the continuity, momentum and energy principles
			CO5: Apply dimensional analysis
18	BTCE306	Constitution of India, Law & Engineering	**CO1:** Identify and explore the basic features and modalities about Indian constitution.
			CO2: Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
			CO3: Differentiate different aspects of Indian Legal System and its related bodies.
			CO4: Discover and apply different laws and regulations related to engineering practices.
			CO5: Correlate role of engineers with different organizations and governance models
19	BTCE401	Engineering Geology	**CO1:** Show the knowledge about engineering geology.
			CO2: Show knowledge of the most important rocks and minerals and be able to identify them.
			CO3: Analyze the Earthquakes and its various types.
			CO4: Understand the characteristics of various Geological Hazards.
			CO5: Do the Geological investigations; understand the geological conditions and geological maps.

20	BTCE402	Universal Human Values	**CO1:** Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society.
			CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
			CO3: Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.
			CO4: Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
			CO5: Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
21	BTCE403	Materials, Testing & Construction Practices	**CO1:** Identify various building materials and to understand their basic properties.
			CO2: Understand the use of non-conventional civil engineering materials.
			CO3: Study suitable type of flooring and roofing in the construction process.
			CO4: Characterize the concept of plastering, pointing and various other building services.
			CO5: Exemplify the various fire protection, sound and thermal insulation techniques, maintenance and repair of buildings.
22	BTCE404	Introduction to Solid Mechanics	**CO1:** Describe the concepts and principles of stresses and strains
			CO2: Analyze solid mechanics problems using classical methods and energy methods
			CO3: Analyze structural members subjected to combined stresses
			CO4: Calculate the deflections at any point on a beam subjected to a combination of loads
			CO5: Understand the behavior of columns, springs and cylinders against loads.
23	BTCE405	Hydraulic Engineering & Machines	**CO1:** Apply their knowledge of fluid mechanics in addressing problems in open channels.
			CO2: Solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
			CO3: Have knowledge in hydraulic machineries like pumps and turbines.

24	BTCE406	Indian Traditions, Cultural and Society	**CO1:**	The course aims at imparting basic principles of thought process, reasoning and inference to identify the roots and details of some of the contemporary issues faced by our nation and try to locate possible solutions to these challenges by digging deep into our past.
			CO2:	To enable the students to understand the importance of our surroundings and encourage the students to contribute towards sustainable development.
			CO3:	To sensitize students towards issues related to 'Indian' culture, tradition and its composite character.
			CO4:	To make students aware of holistic life styles of Yogic-science and wisdom capsules in Sanskrit literature that are important in modern society with rapid technological advancements and societal disruptions.
			CO5:	To acquaint students with Indian Knowledge System, Indian perspective of modern
			CO6:	scientific world-view and basic principles of Yoga and holistic health care system.
25	BTCE501	Geotechnical Engineering	**CO1:**	Classify the soil and determine its Index properties.
			CO2:	Evaluate permeability and seepage properties of soil.
			CO3:	Interpret the compaction and consolidation characteristics & effective stress concept of soil.
			CO4:	Determine the vertical and shear stress under different loading conditions and explain the phenomenon of soil liquefaction.
			CO5:	Interpret the earth pressure and related slope failures.
26	BTCE502	Structural Analysis	**CO1:**	Explain type of structures and method for their analysis.
			CO2:	Analyze different types of trusses for member forces.
			CO3:	Compute slope and deflection in determinate structures using different methods.
			CO4:	Apply the concept of influence lines and moving loads to compute bending moment and shear force at different sections.
			CO5:	Analyze determinate arches for different loading conditions.
27	BTCE503	Concrete Technology	**CO1:**	Understand the properties of constituent material of concrete.
			CO2:	Apply admixtures to enhance the properties of concrete.
			CO3:	Evaluate the strength and durability parameters of concrete.
			CO4:	Design the concrete mix for various strengths using difference methods.
			CO5:	Use advanced concrete types in construction industry.
			CO1:	Understand the importance of units of measurement and preliminary estimate for administrative approval of projects.

28	BTCE504A	Quantity Estimation and Construction Management	**CO2:** Understand the contracts and tender documents in construction projects.
			CO3: Analyze and assess the quantity of materials required for civil engineering works as per specifications.
			CO4: Evaluate and estimate the cost of expenditure and prepare a detailed rate analysis report.
			CO5: Analyze and choose cost effective approach for civil engineering projects.
29	BTCE504B	Modern Construction Materials	**CO1:** Understand the use of modern construction materials.
			CO2: Use geosynthetics and bituminous materials in constructions.
			CO3: Apply knowledge of modern materials in production of variety of concrete.
			CO4: Apply knowledge of composites and chemicals in production of modern concrete.
			CO5: Use modern water proofing and insulating materials in constructions.
30	BTCE504C	Open Channel Flow	**CO1:** Apply knowledge of fluid flow for designing of channel sections.
			CO2: Analyze the gradually varied flow in channel section.
			CO3: Analyze the rapidly varied flow in channel sections.
			CO4: Apply numerical methods for profile computation in channels.
			CO5: Design channels for sub critical and super critical flows.
31	BTCE505A	Engineering Hydrology	**CO1:** Understand the basic concept of hydrological cycle and its various phases.
			CO2: Understand the concept of runoff and apply the knowledge to construct the hydrograph.
			CO3: Apply the various methods to assess the flood.
			CO4: Assess the quality of various forms of water and their aquifer properties.
			CO5: Understand the well hydraulics and apply ground water modelling techniques.
32	BTCE505B	Sensor and Instrumentation Technologies for Civil	**CO1:** Analyze the errors during measurements CO-2 Describe the measurement of electrical variables
			CO2: Describe the requirements during the transmission of measured signals CO-4 Construct Instrumentation/Computer Networks
			CO3: Suggest proper sensor technologies for specific applications CO-6 Design and set up measurement systems and do the studies
33	BTCE505C	Air & Noise Pollution Control	**CO1:** Understand air pollutants and their impacts.
			CO2: Explain air pollution chemistry and meteorological aspects of air pollutants.
			CO3: Demonstrate methods for controlling particulate air pollutants.
			CO4: Demonstrate methods for controlling gaseous air pollutants.

			CO5: Understand automotive emission standards.
			CO6: Apply methods for controlling noise pollution.
34	BTCE505D	GIS and Advance Remote Sensing	**CO1:** Understand the concepts of Photogrametry and compute the heights of objects.
			CO2: Understand the principles of aerial and satellite remote sensing, Able to comprehend the energy interactions with earth surface features, spectral properties of water bodies .
			CO3: Understand the basic concept of GIS and its applications, know different types of data representation in GIS
			CO4: Illustrate spatial and non-spatial data features in GIS and understand the map projections and coordinates systems.
			CO5: Apply knowledge of GIS and understand the integration of Remote Sensing and GIS.
35	BTCE506A	Real Time Systems	**CO1:** Describe concepts of Real-Time systems and modeling.
			CO2: Recognize the characteristics of a real-time system in context with real time scheduling.
			CO3: Classify various resource sharing mechanisms and their related protocols.
			CO4: Interpret the basics of real time communication by the knowledge of real time models and protocols.
			CO5: Apply the basics of RTOS in interpretation of real time systems.
36	BTCE506B	Embedded System	**CO1:** Understand the basics of embedded system and its structural units.
			CO2: Analyze the embedded system specification and develop software programs.
			CO3: Evaluate the requirements of the programming embedded systems, related software architecture.
			CO4: Understand the RTOS based embedded system design.
			CO5: Understand all the applications of the embedded system and designing issues.
37	BTCE506C	Introduction to Mems	**CO1:** Understand the Basic concept of MEMS Fabrication Technologies, Piezoresistance Effect, Piezoelectricity, Piezoresistive Sensor.
			CO2: Explain Mechanics of Beam and Diaphragm Structures.
			CO3: Understand the Basic concept of Air Damping and Basic Equations for Slide-film Air Damping, Couette-flow Model, Stokes-flow Model.
			CO4: Know the concept of Electrostatic Actuation.
			CO5: Understand the applications of MEMS in RF
			CO1: Apply Java in developing Object Oriented code.

38	BTCE506D	Object Oriented Programming	**CO2:** Apply the knowledge of Multi-threading and Streams in developing Java applications.
			CO3: Design and implement applications using GUI and Networking in Java.
			CO4: Apply the knowledge of Collections and Generics for building Java applications.
			CO5: Design and develop Java based applications for solutions to real world problems.
39	BTCEOE506E	Numerical Techniques	**CO1:** Understand about the basics of Ordinary Differential Equations, Separable equations, Equations made separable by change of variables.
			CO2: Retrieve the information content of Power series method.
			CO3: Apply problem specific Bessel's equation, Bessel Functions to engineering applications.
			CO4: Understand about the basics of matrix, Eigen values and eigen vectors.
			CO5: Analysis of Stage wise Processes by the Calculus of Finite Differences, Countercurrent Liquid- Liquid Extraction.
40	BTCEOE506F	GIS & Remote Sensing	**CO1:** Understand about the principles of Remote Sensing and its advantages and limitations.
			CO2: Retrieve the information content of remotely sensed data.
			CO3: Apply problem specific remote sensing data for engineering applications.
			CO4: Analyze spatial and attribute data for solving spatial problems.
			CO5: Create GIS and cartographic outputs for presentation
41	BTCEOE506G	Understanding The Human Being Comprehensively- Human Aspirations And Its Fulfillment	**CO1:** The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
			CO2: It is free from any dogma or set of do's and don'ts related to values.
			CO3: It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
			CO4: This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
			CO5: This self-exploration also enables them to critically evaluate their preconditioning and present beliefs.
			CO1: Analyse and Design RCC beams for flexure by IS methods.
			CO2: Analyse and Design RCC beams for shear by IS methods.

42	BTCE601	Design of Concrete Structure	**CO3:** Analyse and Design RCC slabs and staircase by IS methods.
			CO4: Design the RCC compression members by IS methods.
			CO5: Design various types of footings and cantilever retaining wall
43	BTCE602	Transportation Engineering	**CO1:** Understand the history of road development , their alignment & Survey.
			CO2: Design the various geometric parameters of road.
			CO3: Study the traffic characteristics & design of road intersections & signals.
			CO4: Examine the properties of highway materials & their implementation in design of pavements.
			CO5: Learn methods to construct various types of roads.
44	BTCE603	Environmental Engineering	**CO1:** Assess water demand and optimal size of water mains.
			CO2: Layout the distribution system & assess the capacity of reservoir.
			CO3: Investigate physical, chemical & biological parameter of water.
			CO4: Design treatment units for water and waste water.
			CO5: Apply emerging technologies for treatment of waste water.
45	BTCE604A	Advance Structural Analysis	**CO1:** Analyze indeterminate structure to calculate unknown forces, slope and deflections by different methods.
			CO2: Apply principle of influence lines to analyze indeterminate beams and arches.
			CO3: Analyze and design cable structure with their influence line diagram.
			CO4: Apply basics of force and stiffness methods of matrix analysis for beams, frames and trusses.
			CO5: Apply the basic of plastic analysis to analyze the structure by using different mechanism.
46	BTCE604B	River Engineering	**CO1:** Explain river morphology and its classification.
			CO2: Explain hydraulic geometry and behavior of river.
			CO3: Explain socio-cultural influences and ethics of stream restorations.
			CO4: Analyze flow and sediment transport in rivers and channels.
			CO5: Design guide band, embankments and flood protection systems.
47	BTCE604C	Repair and Rehabilitation of Structures	**CO1:** Understand the fundamentals of maintenance and repair strategies.
			CO2: Identify for serviceability and durability aspects of concrete.
			CO3: Know the materials and techniques used for repair of structures.
			CO4: Decide the appropriate repair and retrofitting techniques.
			CO5: Use appropriate health monitoring technique and demolition methods
			CO1: Understand various methods of Soil Exploration and its importance.
			CO2: Analyze bearing capacity and settlement of soil for shallow foundation.

48	BTCE604D	Foundation Engineering	**CO3:** Design the various types of shallow foundation and understand the basics of deep foundation.
			CO4: Understand the characteristics of well foundations and retaining wall.
			CO5: Understand the concept of soil reinforcement.
49	BTCE605A	Rural Development Engineering	**CO1:** Undertake surveys to decide the status of socio-economic significance.
			CO2: Identify the need of watershed management in rural areas.
			CO3: Suggest relevant government schemes for construction of roads, housing and energy conservation. .
			CO4: Suggest the relevant cottage and agro based industries for the rural areas.
			CO5: Select the relevant schemes of Central/State Government for the rural areas.
			CO6: Apply the principles of rural development in rural areas.
50	BTCE605B	Structure Dynamics	**CO1:** Analyze and Interpret dynamics response of single degree freedom system using fundamental theory and experiments
			CO2: Analyze and Interpret dynamics response of Multi degree freedom system using fundamental theory and experiments
			CO3: Differentiate the effects of various types of dynamic loads
			CO4: Use structural engineering software for dynamic analysis
			CO5: Perform & interpret the results of various experiments on models to understand structural behavior of symmetrical & un-symmetrical structures in plan & elevation
51	BTCE605C	Advanced Concrete Design	**CO1:** Estimate the crack width and deflection with regard to the serviceability.
			CO2: Analyse and design a grid floor system
			CO3: Analyse and design a flat slab system.
			CO4: Discuss fire and seismic resistance of concrete structures.
			CO5: Analyse and design bunkers, silos and chimneys.
52	BTCE605D	Environmental impact assessment and life cycle analyses.	**CO1:** Articulate the value of a Life Cycle Analysis (LCA) and its relationship to total costaccounting and carbon pricing.
			CO2: Describe the theory of an LCA and how carbon foot printing relates to LCA.
			CO3: Outline the steps to conduct an ISO compliant LCA.
			CO4: Define a goal and scope statement of an LCA. Conduct a life cycle inventory of aproduct from cradle to grave.
			CO5: Describe common environmental impacts associated with a life cycle inventory ofprocesses

			CO6: Conduct a screening-level and ISO compliant life cycle assessment with LCAsoftware.
			CO7: Conduct a consequential LCA. Interpret, critique, and communicate LCA results.
53	BTCE606A	Digital and Social Media Marketing	**CO1:** Understand what social media is, the various channels through which it operates, and its role in marketing strategy.
			CO2: Use principles of consumer and social psychology to develop social media content and campaigns that engage consumers.
			CO3: Draw on knowledge about word-of-mouth marketing to develop effective approaches for propagating ideas, messages, products, and behaviors across social networks.
			CO4: Measure the impact of a social media campaign in terms of a specific marketing objective
54	BTCE606B	Idea to Business Model	**CO1:** Examine the challenges associated with defining the concepts of entrepreneur and entrepreneurship
			CO2: Discuss how the evolution of entrepreneurship thought has influenced how we view the concept of entrepreneurship today
			CO3: Discuss how the list of basic questions in entrepreneurship research can be expanded to include research inquiries that are important in today's world
			CO4: Discuss how the concepts of entrepreneurial uniqueness, entrepreneurial personality traits, and entrepreneurial cognitions can help society improve its support for entrepreneurship
			CO5: Apply the general venturing script to the study of entrepreneurship
55	BTCE606C	Machine Learning	**CO1:** Gain knowledge about basic concepts of Machine Learning
			CO2: Identify machine learning techniques suitable for a given problem
			CO3: Solve the problems using various machine learning techniques
			CO4: Apply Dimensionality reduction techniques.
			CO5: Design application using machine learning techniques.
56	BTCE606D	Renewable Energy Resources	**CO1:** Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
			CO2: Know the need of renewable energy resources, historical and latest developments.
			CO3: Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc.

56	BTCE606D	Renewable Energy Resources	**CO4:** Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications. **CO5:** Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications **CO6:** Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations. **CO7:** Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.
57	BTCE606E	Operations Research	**CO1:** Identify and develop operational research models from the verbal description of the real system. **CO2:** Understand the mathematical tools that are needed to solve optimization problems. **CO3:** Use mathematical software to solve the proposed models. **CO4:** Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.
58	BTCE701	Design of Steel Structures	**CO1:** To develop ability to select adequate shape and grade of structural steel. **CO2:** To understand the basis of economical and safe design of steel structures. **CO3:** To develop ability of choosing proper fastener for a particular joint. **CO4:** To develop the ability to design structural steel elements by Limit State Method. **CO5:** Capable of designing Plate Girders. **CO6:** Capable of designing Column bases & Gantry Girders.
59	BTCE702	Project Management & Entrepreneurship	**CO1:** Students will acquire knowledge of basic understanding of project management the terminology and basic concepts of project management and the foundations. **CO2:** Students will strengthen analytical skills in order to solve problems related to project management, namely problems of timing, resource allocation and optimization; **CO3:** Students will demonstrate skills of critical thinking by analyzing problems of planning, project management, in formulating valid conclusions based on their analysis;

			CO4: Students will use information and communication technologies to formulate project feasibility analysis, for their planning and in collaborative project management situations, using specialized planning and management software. projects;
			CO5: Students will demonstrate the ability to analyze a company's balance sheet and income statement;
60	BTCE703A	Water Resources Engineering	**CO1:** Students are able to understand the different types of irrigation.
			CO2: Students should be able to design the canal.
			CO3: Students can explain the effects of water logging.
			CO4: Students should be able to understand the behavior of river.
			CO5: Students can plan the reservoir for different demands.
61	BTCE703B	Ground Improvement Techniques	**CO1:** Identify the problematic soil Suggest the appropriate ground improvement technique as per the requirement of the project (dewatering, densification, stabilization, swelling control etc)
			CO2: Analyse and design the technique for ground improvement
62	BTCE703C	Earthquake Resistant Design of Structure	**CO1:** To explain the basic concepts in seismology and correlate to earthquake engineering.
			CO2: To construct response spectrum of an earthquake and correlate to the construction of design spectra.
			CO3: To formulate analytical model of MDOF systems subjected to earthquake loading for a given time history and analyze using response spectrum methods.
			CO4: To apply the code procedures for seismic analysis, design and detailing of RC building frames.
			CO5: To explain and suggest a suitable seismic resistant measure for masonry load bearing structures.
63	BTCE704A	Probability Methods in Civil Engineering	**CO1:** Apply probabilistic techniques for the analysis of complex Civil Engineering structures using advanced techniques.
			CO2: Demonstrate mathematical and statistical knowledge and skills to be applied in various civil engineering structures.
			CO3: Apply the laws of logic to mathematical statements.
			CO4: Develop mathematical thinking in the conduct of different experiments and presentation of results precisely.
64	BTCE704B	Solid Waste Management	**CO1:** Understand the concept of solid waste management.
			CO2: Explain handling and processing of solid waste.
			CO3: Apply the concept of landfilling for disposal of solid waste.
			CO4: Design composting and other solid waste conversion units.

			CO5: Understand the various hazardous waste, risk assessment and legislation
65	BTCE704C	Geo-synthetics and Reinforced Soil Structures	**CO1:** Identify the type of Geosynthetic and their relevance.
			CO2: Analyze &compute different properties of Geosynthetics.
			CO3: Understand the emerging trends of Geosynthetic in geotechnical applications.
			CO4: Understand the emerging trends of Geosynthetic in geotechnical applications.
			CO5: Design the Reinforced Foundation using Geosynthetic materials.
66	BTCE704D	Disaster Preparedness and Management	**CO1:** Understand the basic concepts of disasters and hazards
			CO2: Classify the natural disasters.
			CO3: Analyze the impacts of disaster on various societal components
			CO4: Understand the components of disaster management cycle and roles of various agencies its risk reduction
			CO5: Understand the process of recovery, reconstruction and development methods
67	BTCE704E	Sustainable Construction Methods	**CO1:** Classify the sustainable construction materials.
			CO2: Apply cutting-edge construction technologies.
			CO3: Evaluate different sustainable construction methods.
			CO4: Apply different rating systems of construction/buildings as a professional.
			CO5: Apply life cycle approach to optimize the performance of green construction materials
68	BTCE705A	FILTER DESIGN	**CO1:** Choose an appropriate transform for the given signal.
			CO2: Choose appropriate decimation and interpolation factors for high performance filters.
			CO3: Model and design an AR system.
			CO4: Implement filter algorithms on a given DSP processor platform.
69	BTCE705B	BIOECONOMICS	**CO1:** Students will be able to understand basic concept of Bioeconomics, challenges, opportunities& regulations
			CO2: Students will be able to understand development and innovation in terms of bioeconomy towards sustainable development
			CO3: Students will be able to understand Inter- and transdisciplinarity in bioeconomy &research approaches
			CO4: Students will be able to explain biobased resources ,value chain, innovative use of biomass and biological knowledge to provide food, feed, industrial products

70	BTCE705C	Design Thinking	**CO1:** Develop a strong understanding of the design process and apply it in a variety of business settings
			CO2: Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behavior
			CO3: Formulate specific problem statements of real time issues and generate innovative ideas using design tools
			CO4: Apply critical thinking skills in order to arrive at the root cause from a set of likely
			CO5: Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments.
71	BTCE705E	Quality Management	**CO1:** Realize the importance of significance of quality.
			CO2: Manage quality improvement teams.
			CO3: Identify requirements of quality improvement programs.
			CO4: Identify improvement areas based on cost of poor quality.
			CO5: Organize for quality and development of quality culture through small group activities
72	BTCE705F	Modeling of Field-Effect Nano Devices	**CO1:** Study the MOS devices used below 10nm and beyond with an eye on the future.
			CO2: Understand and study the physics behind the operation of multi-gate systems.
			CO3: Design circuits using nano-scaled MOS transistors with the physical insight of their funct ional charisticis
			CO4: Understand and study the physics behind the Radiation effects in SOI MOSFETs.
			CO5: Understand the impact of device performance on digital circuits.
73	BTCE705G	Computerized Process Control	**CO1:** Understand the Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer.
			CO2: Design Phase Locked Local Loop, Mixers. Time Division Multiplexed System – TDMPAM system
			CO3: Realize Process model, Physical model, Control Model. Modelling Procedure.
			CO4: Formulate of Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.
			CO5: Design Electric Oven Temperature Control, Reheat Furnace Temperature control.